This bright band may very well correspond to the α Cygni enhanced iron lines 4549·64 and 4556·06 thrown together in the μ Centauri spectrum. It is possible, though, that the dark line 4553·4, quoted by Pickering, is only the dark interspace between the bright 4549·64 and 4556·06 lines.

It may be here remarked that among the brightest lines in the spectra of Novæ at their initial stages are lines agreeing in position with the most marked α Cygni and enhanced Fe lines, and in this way we trace a resemblance between the minor bright lines of μ Centauri and the most conspicuous bright lines—other than those of hydrogen —in the early spectra of Novæ.

Lines corresponding to these bright lines in μ Centauri also occur in the spectrum of γ Cassiopeiæ, but they are far less well-defined in the case of the latter star.

The wave-lengths of the μ Centauri lines given in the table were reduced, by means of Hartmann's formula, from measures made on Pickering's reproduction, the fiducial lines used being 4121·0 (He), H_γ, and H_β.

"On Europium and its Ultra-violet Spectrum." By Sir William Crookes, D.Sc., F.R.S. Received January 26,—Read February 9, 1905.

Europium was discovered in 1901 by Demarçay,* accompanying samarium, from which he separated it by fractional crystallisation of the double nitrates of magnesium and the earths. Demarçay considered that his new earth was identical with De Boisbaudran's $Z\epsilon$ and $Z\zeta$, and was the same which I had announced in 1885† as giving an extremely sharp red line in the phosphorescent spectrum at wave-length 609—an earth which in 1889‡ I said was a new one, and designated by the name of $S\delta$. I detected the earth $S\delta$ during an examination of the phosphorescent spectra given by some of the fractions of samaria and of yttria, neither of the earths being pure.

Europium is the first member of the terbium group, gadolinium being the second member. On the other side it comes next to samarium, the last member of the cerium group. Assuming the oxide of europium to be Eu_2O_3, the element has an atomic weight of 151·8, from the analysis of its sulphate, $Eu_2(SO_4)_3,8H_2O$.

* 'Comptes Rendus,' vol. 132, p. 1484, and 'Chemical News,' vol. 84, p. 1

† 'Phil. Trans.,' vol. 176, p. 691.

‡ 'Journ. Chem. Soc.,' vol. 55, pp. 250—285.

MM. Urbain and Lacombe* have sharply separated europium from samarium in the manner outlined by them in my note on gadolinium† by fractional crystallisation of the double nitrates of bismuth or magnesium with the nitrates of the rare earths. I owe to the kindness of M. Urbain a sufficient quantity of the oxide of europium to enable me to obtain a good series of its photographed spectrum, a copy of which accompanies the present paper. (Not reproduced.)

Exner and Haschek have measured the wave-lengths of the europium lines‡ from material supplied by Demarçay. A comparison of their lines with mine shows that the material was by no means pure.

Urbain's europia is not quite so free from impurities as his gadolinia. I have been able to detect in my photographs the following lines:—Gadolinium is represented by very faint lines at 3450·55, 3481·99, 3585·10, 3646·36, 3654·79, 3656·32, 3664·76, 3697·90, 3699·89, 3743·62, 3768·52, 3796·58, 3805·70, 3850·83, 3851·16, 4050·08, 4225·33. Yttrium is represented by the line at 3774·51, lanthanum by the line at 3988·66, and calcium by the two lines at 3933·825 and 3968·625.

No lines of bismuth or magnesium are to be seen.

Most of the lines of impurities are exceedingly faint, showing that the impurity is only present in very minute proportion. Indeed, I have only mentioned them if they correspond with strong lines in the gadolinium or other spectra. Both in the europium and the gadolinium spectrum I have not attempted to give wave-lengths of all the excessively faint lines. If at some future time it becomes of interest or value to ascertain their wave-lengths, all the necessary data are present whereby they can be identified.

* 'Comptes Rendus,' vol. 138, pp. 84, 627, 1166; 'Chemical News,' vol. 89, pp. 52, 179, 277.

† *Supra*, p. 420.

‡ 'Wellenlängen-Tabellen für Spektralanalytische Untersuchungen,' F. Deuticke, Leipzig und Wien, 1902.